

Groundnut Policies, Global Trade Dynamics and the Impact of Trade Liberalization

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Abstract: Groundnut products are of central economic importance to millions of smallholders in Africa, India and Southern China. The products generate 60 percent of rural cash income and account for about 70 percent of the rural labor force in Senegal and Gambia. Groundnut trade remains, however, heavily distorted, and this has affected the competitive position of various players in world markets. Using a new partial-equilibrium, multi-market, international model, we analyze the trade and welfare impacts of several groundnut trade liberalization scenarios compared with the recent historical baseline. Net welfare is evaluated as the sum of consumers' equivalent variation, quasi-profits in farming, quasi-profits in crushing, and taxpayers' revenues and outlays implied by distortions. We find that trade liberalization in groundnut markets has a strong South-South dimension with policies in India, and to a lesser extent China, heavily depressing the world prices of groundnuts at the expense of smaller developing countries mainly located in Africa. Under free trade, African exporters would gain because they are net sellers of groundnut products. In India, consumers would be better off with lower consumer prices resulting from the removal of prohibitive tariffs and large imports of groundnut products. The cost of adjustment would fall on Indian farmers and crushers. In China, crush margins would improve because of the large terms of trade effects in the oil market relative to the seed market. China's groundnut product exports would expand dramatically. Net buyers of groundnut products in OECD countries would be worse off. We draw implications for the Doha negotiations.

Keywords: Doha, groundnut, peanut, oil, trade liberalization, protection, distortion, negotiations

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I. INTRODUCTION

World production of groundnuts stood at 34 million tons in 2001, accounting for 10 percent of the world's total oilseed production of 324 million tons¹. China is the world's largest groundnut producer, with 40 percent of world's production, followed by India (23 percent), a group of Sub-Saharan African (SSA) countries (8.4 percent) and the United States (5.6 percent). Groundnuts provide a valuable source of protein, fats, energy, and minerals, and generate cash income to many poor farmers in the developing world, especially in SSA and Asia. In Senegal for instance, groundnut account for 70 percent of the rural labor force and 60 percent of households' agricultural income. Groundnut production and processing represent about 2 percent of GDP and 9 percent of exports in that country.

Due to generally high level of self-consumption, international trade in groundnuts is thin: only 5 percent of world production is sold in the international markets. Of the three major groundnut products traded internationally (edible groundnuts, groundnut oil and groundnut meal), edible groundnuts are the most traded, with a volume of 1.2 million tons in 2001, against 250,000 tons for groundnut oil. Further, the different groundnut products face different export dynamics in international markets. While global export of edible groundnuts increased by 2.2 percent over the last 20 years, exports of groundnut oil and meal declined by 1 and 2.5 percent annually despite growing global consumption of these two products.

China is the world largest exporter of groundnut, with 32 percent of world edible groundnut exports, followed by the US (19 percent) and Argentina (10.5 percent). Sub-Saharan Africa (Senegal, Gambia, Nigeria, Malawi, South Africa and Sudan) has lost most ground in world edible groundnut markets, and collectively accounts for only 5 percent of the world market. In the groundnut oil market segment however, Senegal is the largest supplier, but this market has become all the more thinner as other vegetable oils are increasingly used as substitutes of groundnut oil.

Since the mid 1990s, all major exporters have been gradually liberalizing their groundnut sectors, in part to fulfill their commitments under WTO agreements. However, the results are mixed and trade in groundnut products remains heavily distorted. Both China and India have removed some import restrictions and have allowed wider private sector participation in importing groundnuts. Still, tariffs on groundnut products remain very high in India and to a lesser extent in China. The market size of both countries exacerbates these distortions and their effects on the world market. In the US, the 2002 Farm Bill has suppressed many unsustainable features of the previous groundnut policies (e.g., the high support price and production quotas) but has introduced new distortions, such as counter-cyclical payments and the floor price mechanism. These policies would subsidize U.S. groundnut exports in situations of low world prices with a potential to depress world market prices. Argentina still selectively subsidizes some processed groundnut products and exports and applies moderate export taxes on groundnuts. In SSA the heavy producer taxation of earlier government intervention has ended, and unilateral liberalization efforts are continuing. Protection of processing remains significant however.

¹ Groundnuts are also known as peanuts, earthnuts, goobers, pinders, and Manila nuts. The groundnut plant is a hairy, tap rooted, annual legume that measures 1 to 1.5 feet in height. Shelled groundnuts are basically used as seed, consumed as raw edible groundnuts or after transformation into "prepared" groundnuts (roasted, salted, flavored, etc.) or into groundnut butter/paste. They can also be crushed for oil and a by-product, groundnut meal (animal feed). Groundnut oil is an excellent quality cooking oil with a high smoke point (440 degree F) and neutral flavor and odor. It allows food to cook quickly with a crisp aspect and with little absorption.

The current situation raises many important questions about the future of the sector and prospects for various players. How will multilateral groundnut trade liberalization affect the competitive positions of the various players? Which countries are likely to gain and capture larger market shares and which ones will lose? How will small SSA producers be affected? We address these questions in this paper.

The next section examines the dynamics of global production, trade and prices of groundnut products. The third section reviews the groundnut policies of the major players in the groundnut market, with an emphasis on the most distortive policies. In the fourth section, we use a multi-market, partial-equilibrium model to assess the impact of removing major policy distortions on world prices, trade flows, and welfare for major producing and trading countries involved in the groundnut market. We analyze multiple scenarios. First, we consider full multilateral trade liberalization for groundnut products with and without the removal of the U.S. groundnut program. Then we consider multilateral groundnut trade liberalization, again with and without the removal of the U.S. farm groundnut program. Then we consider full trade liberalization in the two largest and most distorted groundnut markets, India and China. The last section derives the major policy implications of the study and concludes.

II. GROUNDNUT PRODUCTION AND TRADE

Groundnut Production, Cost, and Utilization

Groundnuts belong to the oilseeds category and account for 16 percent of world oilseed harvested area. The major producers are China, with 40 percent of world's production, followed by India (23 percent), Sub-Saharan Africa (8.4 percent), the United States (5.6 percent) and, to a lesser degree, Japan (Table 1).

Table 1. Groundnut production and utilization, average 1996-01

Country	Area harvested (1000 ha)	Yield (mt/ha)	Production (1000 mt)	Domestic Utilization (1000 mt)	Food use (1000 mt)	Crushed (1000 mt)	Feed/seed (1000 mt)	Net Export (1000 mt)
World	21452	1.4	29997	29896	12416	14590	2891	169
Main producers and exporters								
China	4234	2.9	12204	11777	4753	6140	884	427
India	7902	0.9	7176	7082	534	5581	967	94
USA	569	3.0	1701	1428	978	280	170	220
Argentina	280	1.5	403	191	21	155	15	213
Main producers in Africa								
Nigeria	1187	1.1	1340	1340	636	427	278	0
Senegal	690	1.1	722	730	317	304	109	-6
South Africa	98	1.7	161	123	72	32	19	33
Malawi	117	0.9	103	101	78	18	5	2
Gambia	89	1.0	95	80	26	54	0	15
Main importers								
EU	1	1.0	1	454	433	17	5	-449
Canada	0	0.0	0	115	115	0	0	-115
Japan	12	2.3	28	129	121	2	6	-103
South Korea	7	2.2	15	30	30	0	0	-15

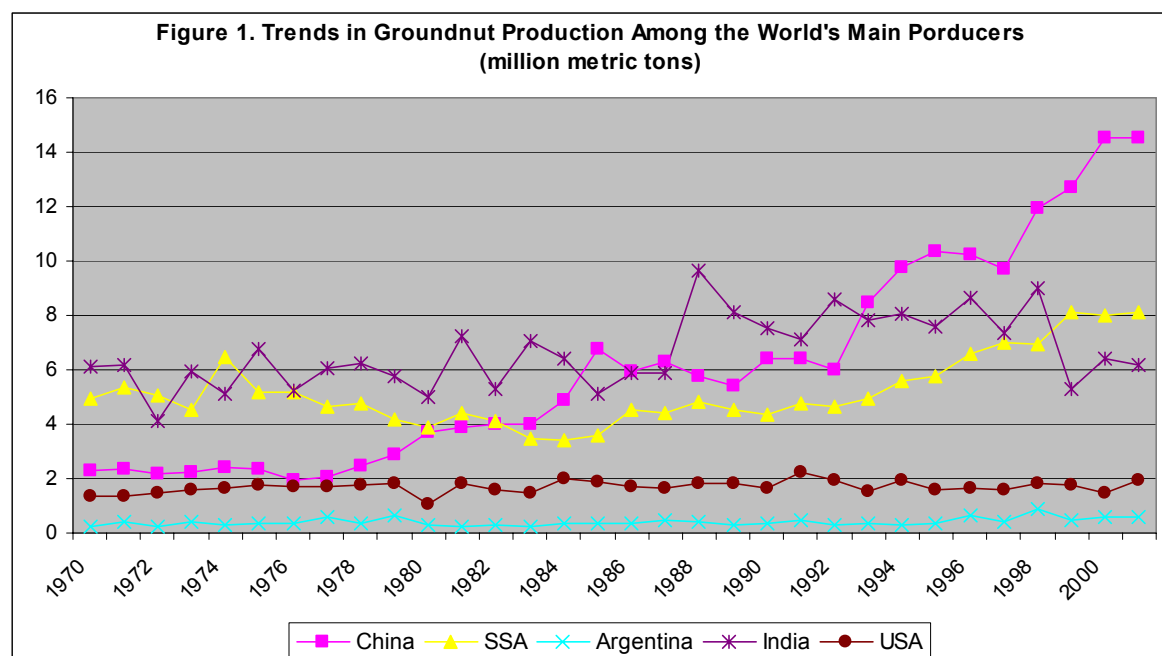
Source: USDA

Note: The difference between production + net exports and domestic utilization reflects stock variation, not shown here
Ending stocks are negligible for all country except the US for which it stood at 28 percent of total production during 1996-01

Groundnut production conditions vary considerably across countries, reflecting

differences in technological development, access to modern inputs and irrigation, and farm management practices. Table 1 shows large differences in yields across major producing countries. Groundnut yields are highest in the United States and China, and lowest in SSA (except South Africa) and India. Yet between the US and China, important differences exist in farm practices. While in the U.S. production is highly mechanized, the high yields in China reflect high labor-intensive farming practices in small plots of land and intensive use of draft animal (Colby et al. 1992). The low yields in Africa and India are the result of limited use of modern inputs including high-yielding seed varieties and high dependence of production upon rainfall.

Driven by a tremendous growth in China, global production of groundnuts exhibited a strong expansion between 1981 and 2000. Shelled groundnut production grew by 34 percent between 1981-85 and 1996-00. Growth in production has however been uneven across countries. As Figure 1 shows, production growth in China has been impressive, following Chinese 1978 market reforms². This country doubled its production between 1992 and 2000. Groundnut production in India grew up from 1987 to 1998, before dropping to its 1970s level of 6 million tons in recent years. Indian production exhibited however important fluctuations throughout this whole period. Production in SSA picked up in the early 1990s, after a long period of decline. Groundnut production in the United States and Argentina stagnated around 2 million and 300,000 metric tons respectively over the last three decades.



Source: Oil world.

Table 2 compares the economic cost per acre between the U.S. and China, the two countries of comparable yields and that account for about half of the world groundnut production

² China took also advantage of increased use of high yield varieties (HYV) and agricultural inputs (fertilizers, pesticides, insecticides, mechanization, and irrigation) to boost yields and production (Colby et al. 1992).

and 50 percent of world's edible groundnut export in 2001. Due to lack of more recent data, the comparison is done for the years 1992 and 1993. As Table 2 shows, economic costs per acre were more than three times higher in the US than in China in the early 1990s. Cost per acre in groundnut production stood at \$694.03 on average for the United States, more than three times higher than the average cost for China, \$164.45 per acre, in 1993.

The larger economic costs per acre for U.S. groundnuts were chiefly attributed to production quota rent, land value, and "other expenses" (i.e., costs of using and maintaining farm equipment, cost of fuel, electricity, repair, capital replacement). Quota rent and land value are not an effective cost for farmers in China, since there is no production quota as such in China, and land is considered as a public property, belonging to local communities organized in groups of 30-40 households (Chen et al. 1997)³. Net returns between the U.S. and China were not significantly different if one excludes quota rent (irrelevant since the 2002 Farm Bill) in US production costs. US cost disadvantage is however compensated by higher producer prices brought about by the groundnut program and higher US quality groundnuts. The elimination of quota production (thus quota rent) in the 2002 Farm Bill reduces further US production costs. This development as well as the reputation of high quality groundnut producer warranting a high price premium in international market may well uphold US future competitiveness vis-à-vis China⁴.

Table 2. Economic costs and returns in groundnuts, China and the U.S.
(US\$/acre, 1992 and 1993)

Item	1992		1993	
	US	China	US	China
Variable costs:				
Seed	70.32	43.83	71.18	45.96
Fertilizer	43.27	25.03	42.40	26.13
Chemicals	89.70	3.40	92.57	3.68
Labor	89.14	71.51	86.17	75.86
Other expenses	212.84	41.43	188.54	12.82
Subtotal	505.27	185.20	480.86	164.45
Fixed costs:				
Land value	92.58		97.77	
Quota rent	113.38		115.40	
Total Costs:	711.23	185.20	694.03	164.45
Yield (lb/acre)	2576	2520	1940	2135
Revenue (producer price*yield)	753.66	323.69	570.58	280.83

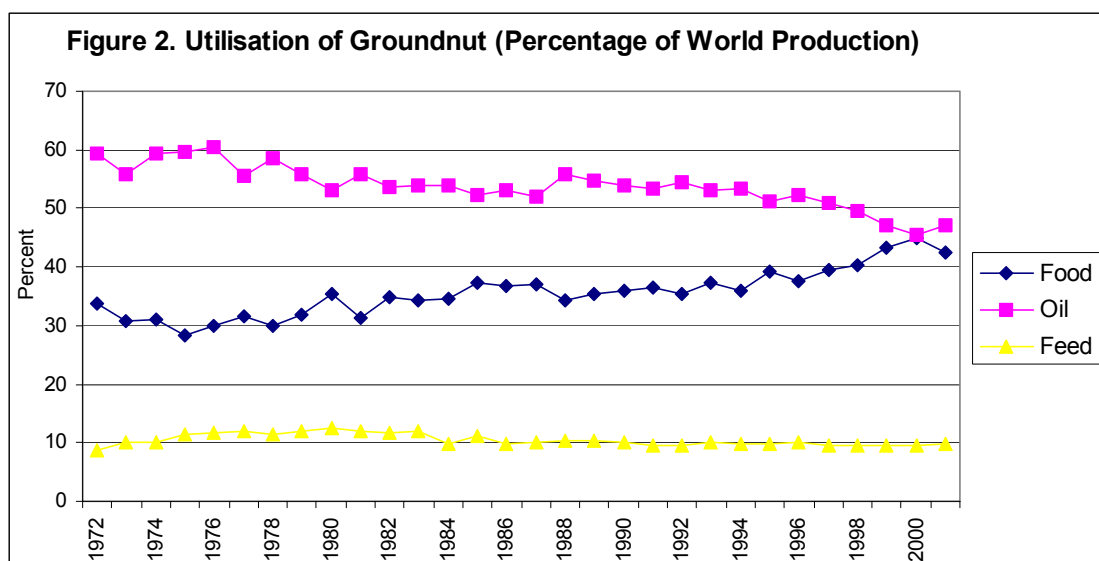
Source: Chen et al. (1997)

There has been a gradual increase in the use of groundnuts for food purposes, and a resulting decline in the share of groundnut production crushed for oil and meal over the last 20 years (Figure 2). The largest increase in food use occurred in developed countries and fast

³ Any growers in the group are eligible to farm a certain number of acres of land. Farmers who use the land are obligated, however, to pay agricultural tax in kind and sell a certain amount of their products to the state government at regulated prices (Chen et. 1997).

⁴ Export markets display relatively high quality premiums/discounts depending upon quality reputation of exporters. Prices of groundnuts originated from the US set in fact a ceiling for international prices because the US export high quality groundnuts which command a relative high price premium in international markets. In 2000, edible U.S. groundnuts commanded a 40 percent premium on world markets compared to shelled Chinese groundnuts, according to FAO trade data.

growing economies in Asia⁵. In contrast, producers in India and most of SSA still devote more than 60 percent of their production to crushing for oil and meal. The overall declining use of groundnut for oil and meal reflects the increasing availability of cheaper, low-fat vegetable oils such as soybeans and rapeseeds, as substitutes. Similarly groundnut meal competes with meal from other oilseeds and with cereal-based products such as maize gluten.



Source: Oil World.

Global Trade and Market Shares Dynamics

Among the different groundnut products, shelled edible groundnuts, prepared groundnuts and groundnut oil are the most traded products in international markets. Table 3 shows the trade balance of each of these products for the major countries involved in groundnut trading in groundnut markets in 1996-2000. Countries with net exports over US\$100 million are China, Argentina, and the U.S. The bulk of these countries' exports is constituted of edible groundnuts. India's trade balance reached US\$94 million while Senegal, the largest African net exporter in the period registered a US\$53 million groundnut trade surplus. Ninety two percent of Senegalese net export was groundnut oil.

The EU, Canada and Japan are the major edible groundnut markets. The EU is the world's largest groundnuts market, accounting for 43 percent of world groundnut imports. EU's total value of net groundnut imports was just below US\$500 million in 1996-2000. The other important groundnuts markets include Canada (9 percent of world imports) and Japan (8.2 percent).

Table 3. Value of net exports, by groundnut product, 1996-2000

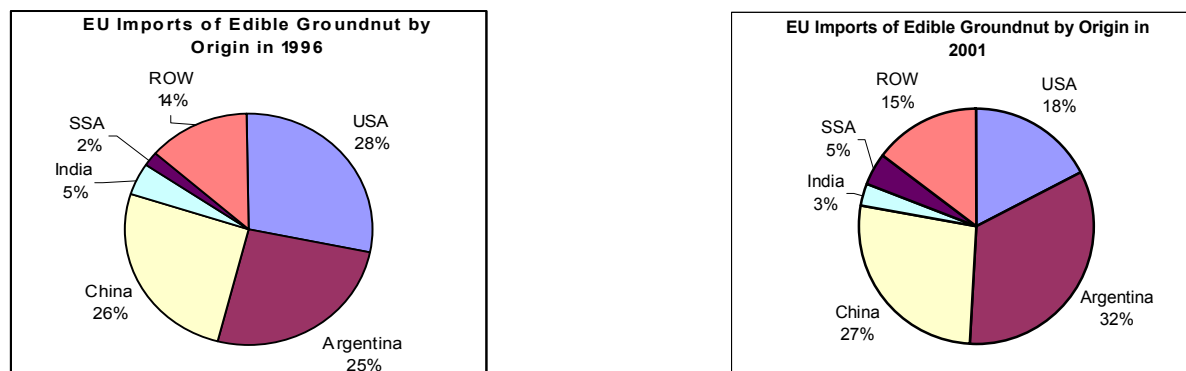
	Value of Net Exports in Million US \$			
	Edible Groundnut	Groundnut Oil	Prep. Groundnut	Total
China	193.79	2.82	111.06	307.68
India	86.85	-0.13	7.27	93.99
USA	126.43	-12.77	28.26	141.92
Argentina	160.98	51.52	25.82	238.32
Nigeria	-3.29	4.64	0.00	1.35
Senegal	3.34	48.99	0.60	52.92
South Africa	16.01	4.68	0.27	20.95
Malawi	0.77	0.00	0.00	0.77
Gambia	4.49	1.09	0.05	5.63
European Union (15)	-378.47	-115.12	-4.54	-498.13
Canada	-76.67	-1.19	-3.31	-81.18
Japan	-44.00	-1.85	-71.46	-117.31
Korea, Republic of	-4.55	0.01	-14.31	-18.86

Source: FAOSTA, 2002

Note: Prepared groundnut = roasted, salted, flavored groundnuts. Peanut butter not included.

Figure 3 and 4 show the structure and trend of EU's edible groundnut (Figure 3) and groundnut oil (Figure 4) imports. Competition among exporters in this market has increased. The US has lost share in the EU edible groundnuts market between 1996 and 2001 to Argentina, which has become the top exporter of that particular product in that market (Figure 3).

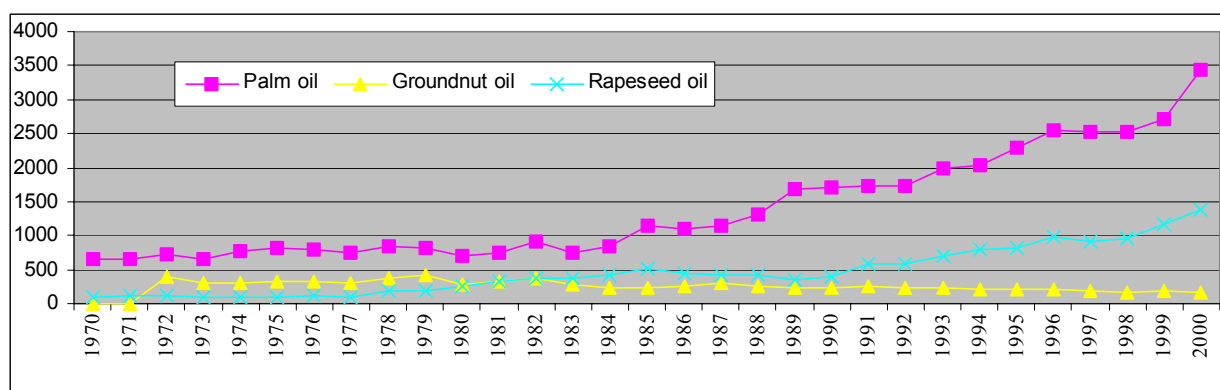
Figure 3. Competition in the EU edible groundnut market



Source: Oil World

Imports of groundnut oil are much more concentrated than that of edible groundnut, but here also, the EU represents a sizable block, with more than 60 percent of world imports for the 1996-2000 period. Demand from the EU has declined overtime as cheaper vegetable oils were increasingly substituted for groundnut oil. As Figure 6 shows, even as EU's demand for groundnut oils has increased substantially, groundnut oil lagged behind that of palm and rapeseed.

Figure 4. EU's import of groundnut oil versus palm and rapeseed oils



Figures 5a to 5f depict the trends in exports and market shares of raw edible groundnuts prepared groundnuts and groundnut oil since 1976. Consistent with growth in world consumption of raw edible and prepared groundnuts, export of these two products expanded rapidly since the mid-1980s. Exports of edible groundnut increased by 8 percent between the first and second half of 1990s. This growth followed a dramatic increase of over 20 percent over the 1980s. The pattern of growth in prepared groundnut export broadly mirrors that of edible groundnuts signaling the highly integrated nature of these markets as shown in Figure 5c.

China has been the major beneficiary in the expansion of the groundnut markets while the U.S. role has decreased significantly. From barely 1 percent in 1976, China's market share in the world edible groundnut market increased dramatically to 32 percent in 2001. During the same period, US' market share dropped from 32 percent to 19 percent (Figure 5b). The emergence of China as a leading groundnut exporter is even more impressive in the prepared groundnut market. Other producers have increased their share from about 20 percent to 35 percent (Figure 5d), also contributing to the erosion of the U.S. export market share.

While the international edible groundnut market has become more concentrated with 61 percent of exports controlled by China, the US and Argentina in 2001, the market for prepared groundnuts has become more fragmented. The concentration of the edible market partially reflects the significant decrease in SSA's share, from 17 percent to 5 percent. African shares have been quite volatile, as several African countries (including Nigeria, Malawi, and the Gambia) enter intermittently the edible export market depending on their crop quality and world market demand, and are not dependable suppliers in this market.

Over the last 25 years, many countries have exited the groundnut oil market (e.g., Brazil) or have chosen to enter it only when the quality of groundnut harvested cannot be sold in the edible market (e.g., United States). In this rather stagnant groundnut oil world market, Argentina and Senegal remain the world's leading exporters but the market has significantly fragmented. In 1976, Senegal, Argentina, Brazil, and the United States supplied 85 percent of total exports while in 2001, these four countries represented only 52 percent of total exports. China and Brazil experienced sharp decreases in shares as they elected to exit the groundnut oil market and shift emphasis on edible groundnut and other vegetable oils.

Figure 5. The world groundnut markets: exports by product and market shares

Figure 5a. World export and “consumption” of raw edible groundnuts (1000 metric tons)

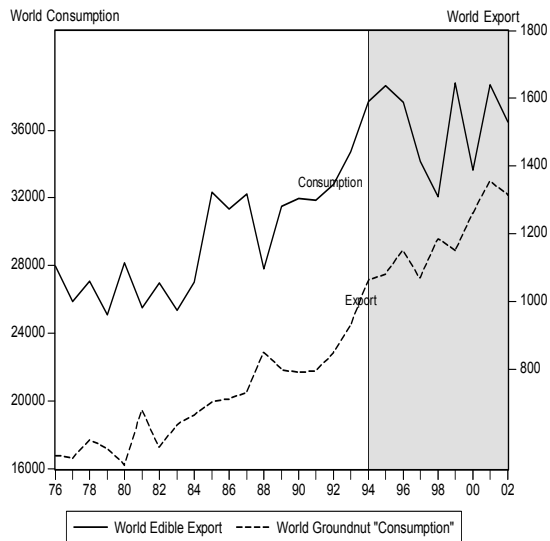


Figure 5b. Market shares in world raw edible groundnuts

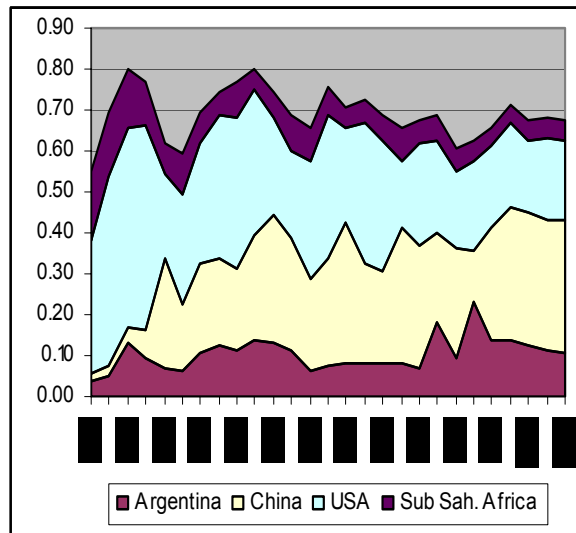


Figure 5c. World export of prepared groundnuts (tons)

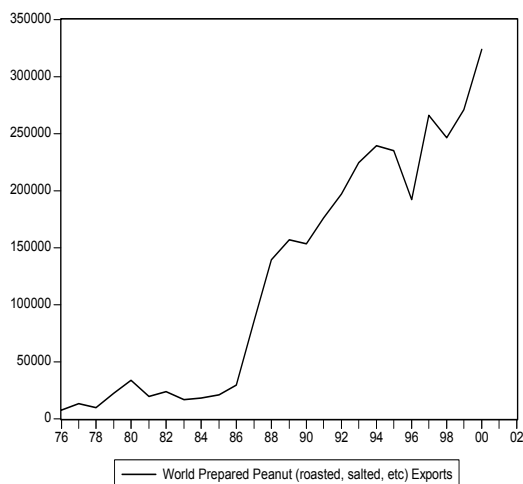
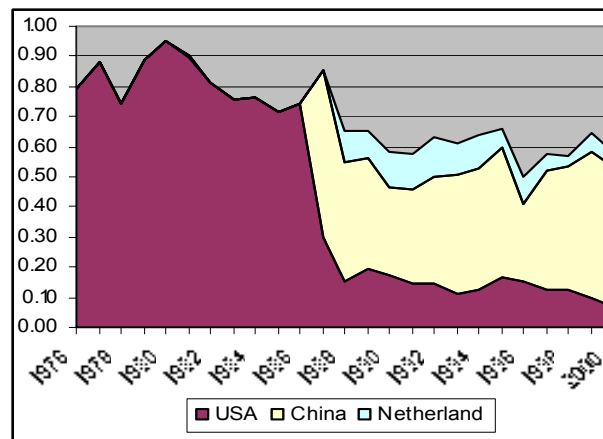
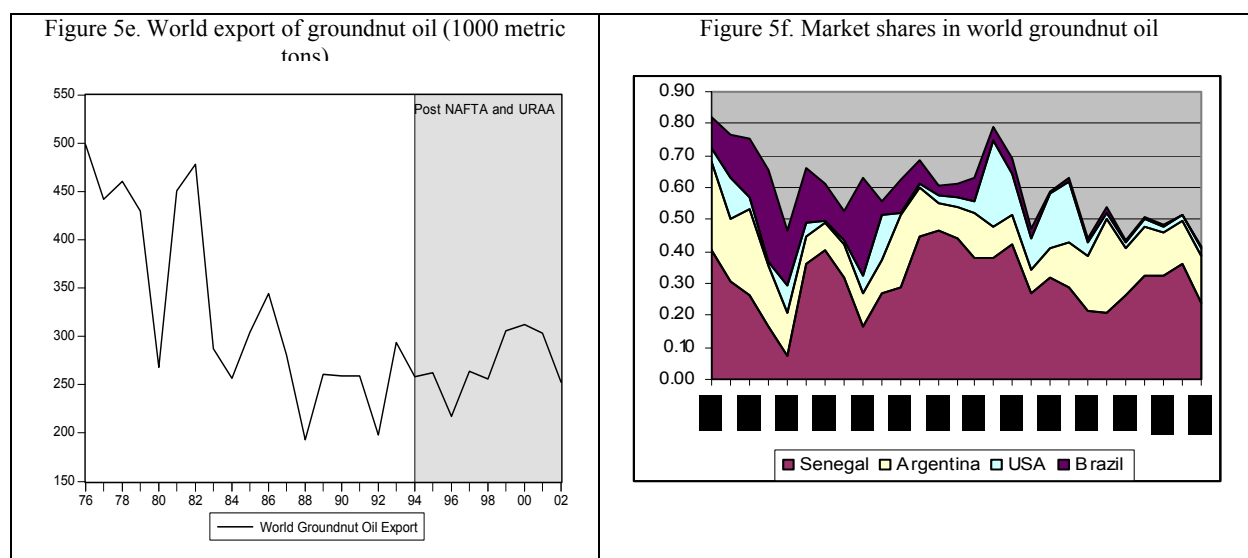


Figure 5d. Market shares in world prepared groundnut





The decline in African country shares in world groundnut markets has significantly reduced the contribution of groundnut products in export earnings of many countries. As Table 4 shows, the importance of groundnut products as a source of export earnings has declined dramatically in Senegal and South Africa and in Malawi since the early 1980's. It has only increased in Gambia significantly in Gambia where it accounted for 84 percent of total good exports in 2000-02.

Table 4 also depicts the changes in the volume and value of groundnut exports, for shelled (raw edible) groundnuts and groundnut oil. The volume exported of raw edible groundnuts decreased significantly in Malawi, Nigeria and South Africa and quasi-stagnated in Senegal and Gambia. As a result of declining and quasi-stagnant volumes, shelled groundnut export earnings dwindled, but the extent of the decline suggests that unit values have decreased for Malawi, Gambia and Senegal. This is confirmed in Figure 6. The export performance of groundnut oil is more contrasting. Senegal and Nigeria have increased both their volume and value of exports while South Africa significantly exited the groundnut oil market.

Table 4. Share of groundnut products in total merchandise exports

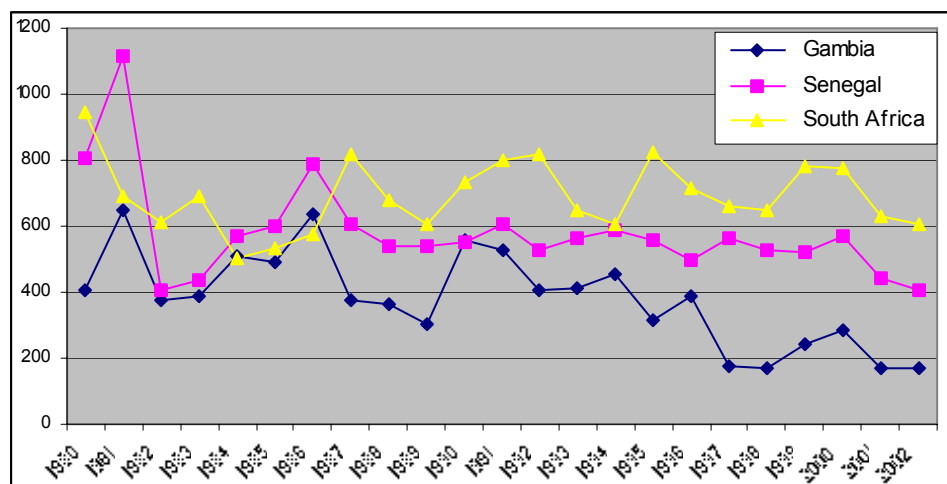
		Nigeria	South Africa	Senegal	Gambia	Malawi
Shelled gr. export volume (metric ton)	1980-82	1,026	41,333	2,725	27,333	14,867
	2000-02	412	34,830	2,915	27,939	662
Shelled groundnut exports (1000 US\$)	1980-82	400	29,730	2,145	11,743	12,333
	2000-02	204	22,875	1,371	5,763	436
Gr. oil export volume (metric ton)	1980-82	0	22,667	82,693	7,651	0
	2000-02	1,287	1,519	98,879	8,633	0
Groundnut oil exports (1000 US\$)	1980-82	0	14,071	60,285	6,400	0
	2000-02	797	1,053	63,007	6,333	0
Share of gr. In total exports (%)	1980-82	0.003	0.21	16.17	59.62	4.65
	2000-02	0.006	0.08	8.16	84.64	0.10

Source: Production and groundnut exports data, FAOSTAT; Total good exports, WDI

Note: The share of groundnuts in total good exports include export of groundnut meal

The evolution of Africa's edible groundnut exports prices has not been uniform across major African exporters. As Figure 6 shows, despite a decline in recent years, prices for South African groundnuts have held up on average at a high level since the mid-1980's. In contrast, prices sharply declined for Gambia and, to a lesser degree, Senegal. The discount on the latter two countries' prices reflect their lower groundnuts quality and stricter EU quality and technical standards. The EU has indeed become more demanding, both from a public health perspective (permissible level of aflatoxin)⁶, and from a technical standpoint (size, uniformity).

Figure 6. Unit value of raw edible groundnut of African origin (US\$/ton)



Groundnuts International Prices

International prices of edible groundnuts and groundnut oil in Rotterdam market (the reference for groundnut trade) exhibit two distinct patterns since 1970 (Figure 7). First, during 1970-81, both prices were non-stationary, drifting away, and following an increasing trend. Co-integration tests show no co-integration between edible groundnut and groundnut oil during this period (Annex Tables 1 to 3). Prices were high and the world market was dominated by the US and SSA which supplied respectively 45 and 18 percent of world exports. China exported no edible groundnut or groundnut oil.

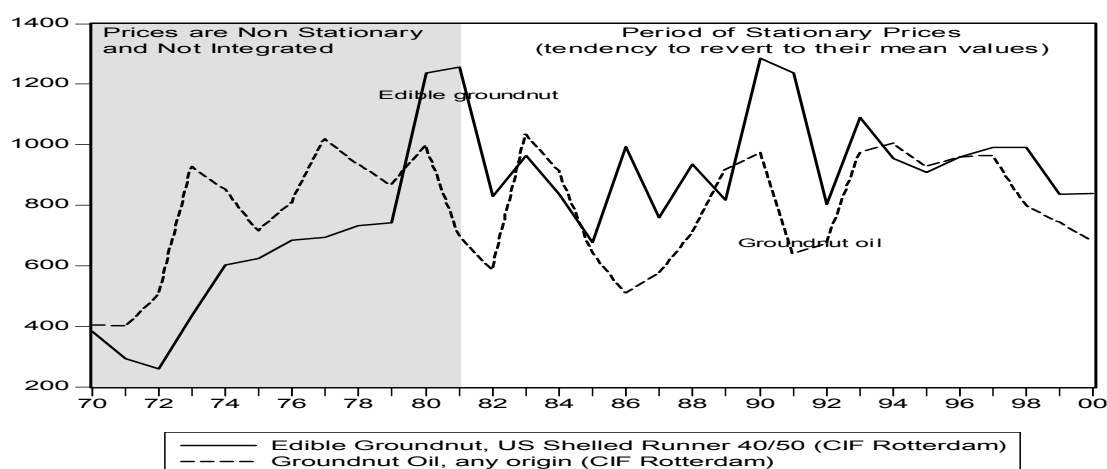
Second, in sharp contrast with the 1970s, groundnut prices over the last 20 years have been stationary, constantly reverting to their mean values following shocks (Annex Tables 4&5). Price fluctuations were thus important but two sub-periods can be distinguished. Prior to 1994, prices of groundnuts displayed a higher level of volatility. The coefficient of variation of prices stood at 20 percent between 1980 and 1994 against only 7 percent between 1995 and 2001. This shift in world price variability warrants at least two questions. First, what are the main causes? Second, is the change in price variability permanent?

⁶ Aflatoxin is a cancer-causing chemical produced by species of aspergillus moulds that can contaminate groundnuts. The spores of these moulds, present anywhere in the air and the soil, require specific temperature, moisture and nutrient substrates to germinate. Aflatoxin contamination of groundnuts can occur during its cultivation in the field, as well as during harvesting, post-harvesting, storage and processing. While aflatoxin disappears with crushing, they tend to be present in groundnut meal and edible groundnuts.

Revoredo and Fletcher (2002) recently addressed these specific questions. They analyze both production instability (originated in producer-exporting countries) and consumption instability (originated in consumer-importing countries) and find that steady expansion of Chinese exports, which are negatively correlated with exports from US and Argentina, have been a stabilizing force in the second half of the 1990s. This occurs in spite of the fact that India, Argentina, and South Africa now transmit a higher proportion of their supply shocks to the world market (Revoredo and Fletcher 2002). It seems therefore that substitution between Chinese and US groundnuts has increased in recent years, but detailed data on substitution in world markets to substantiate this inference is as yet inconclusive.

Regarding the groundnut oil market, the influence of Senegal on world prices remains significant. In 2000/01, Senegal exported about 100,000 metric tons of groundnut oil, representing one-third of the world's export and more than 60 percent of demand from EU, Senegal's main export market. While 2000/01 was an exceptional production year, Granger causality tests strongly indicate that variations in Senegal's exports Granger-caused international prices and the reverse was not true (Table A6).

Figure 7. International prices of groundnuts, Rotterdam, CIF, \$/metric ton



Finally as Figure A1 (Annex) shows, groundnut oil markets are broadly integrated with that of other vegetable oils (soy oil, rapeseed oil, palm oil, and sunflower oil), however, the integration between oilseeds markets other than groundnuts seems to be much stronger.

III. DOMESTIC GROUNDNUT POLICIES OF MAJOR COUNTRIES IN WORLD MARKETS

This section reviews the groundnut policies of the US, China, India, Argentina and SSA. Since domestic producer support/taxation and trade policies essentially determine excess supply and trade flows, it is necessary to examine them in some detail to anticipate the potential implications of policy changes on the distribution of gains/losses across countries.

Groundnut Policies in the United States

Groundnut products are a minor sector nationally, but they are a key component of agriculture and rural development in the Southern part of the United States. Based on USDA

Census of Agriculture, many counties in the South derive 50-70 percent of their agriculture income from groundnut. The first level of value-added activities, such as shelling, are performed locally as are many groundnut products manufacturing (Fletcher 2001). Groundnut policies have played a major role in maintaining rural income in these regions of the US.

The foundation of U.S. groundnut policy is the U.S. peanut program, which traces its roots to the 1930s. Until the signature of the New Farm Bill in May 2002, the pillars of the system were production regulation through quotas, high producer support prices, and import control. The groundnut support program existed as a two-tier price support program. The support price for edible groundnuts was \$610 per short ton paid for production under quota. Other groundnuts (“additional”) could be either exported at world prices or sold to the domestic crush industry and were eligible for a lower support price (\$132 in 2001). The quota farmgate price tended to be higher than the prevailing export prices as shown in Table 6.

Table 6. Producer support prices and international prices

Prices faced by peanut producers under former peanut programs (US cents/pound)						
Item	1993/94	1994/95	1995/96	1996/97	1997/98	1998/99
Quota price	38.8	33.9	33.9	30.5	30.5	30.5
Additional price	6.6	6.6	6.6	6.6	6.6	6.6
Average farm price	30.4	28.9	29.3	28.1	28.3	28
CCC export price	20	20	20	20	20	20
Export unit value	33	28.6	29.2	32.2	32.7	32.8
Rotterdam c.i.f. Price	37.1	29.2	33.6	31.6	36	29

Source: Skinner (1999)

The domestic support as measured by the aggregate measure of support (AMS) for U.S. groundnuts was estimated at around \$330 million during that year or \$31 million more than the average AMS for 1996-2001. The average cost of aggregate support in 1996-01 stood at \$206 per metric ton of groundnut produced in the U.S. (Table 7).

Table 7. U.S. aggregate measurement of support (million dollars)

	1986-88	1995-96	1996-97	1997-98	1999-2000	2000-01
AMS Million US\$	347.2	414.6	299	305.76	300	330
AMS/ Metric Ton of US Production	203.3	264.1	180.0	190.5	172.7	222.8

Source: Skinner (1999), Hart and Babcock (2002) for 2000-01 AMS and USDA database for production data

With the 2002 farm bill, groundnut production quotas were eliminated (with a quota buyout) and the groundnut price support program converted to a system of direct and counter-cyclical payments, and a price floor *cum* production subsidy (non-recourse loans with marketing loan provisions). The key features of the new program are detailed as follows:

- (i) All current groundnut producers have equal access to a marketing loan program, under which producers can pledge their crops as collateral to obtain a marketing loan rate equal to \$355 per short ton. Producers may repay the loan at a rate that is the lesser of USDA-set repayment rate plus interest or the marketing loan rate plus interest, or they can forfeit the loan.
- (ii) For producers with a history of groundnut production, a new direct and fixed payment of

\$36 per ton is available. Historic producers are those involved in groundnut production during the period 1998-2001. Eligible production would equal the product of average yield in the base-period and 85 percent of base-period acres. These payments are made regardless of current prices or the actual crop planted, so long as the farm remains in approved agricultural uses.

(iii) Producers with a history of groundnut production are also eligible for a new counter-cyclical payment when market prices are below an established target price of \$495 per ton minus the \$36 per ton direct payment. The payment rate is the difference between the target price (\$495 per ton) minus the direct fixed payment (\$36 per ton), and the higher of the 12-month national average market price for the marketing year for groundnut or the marketing assistance loan rate (\$355 per short ton). Total counter-cyclical payment to each eligible producer is calculated as the product of the payment acres (85 percent of base acres), the base-year average yield and the payment rate.

(iv) Owners of groundnut quota under the previous legislation receive compensation payments for the loss of quota asset value. Payments may be made in five annual installments of \$220 per short ton during fiscal years 2002-06, or the quota owner may opt to take the outstanding payment due in a lump sum. These payments are based on the quota owner's 2001 quota, so long as the person owned a farm eligible groundnut quota (Wescott, Young, and Price 2002).

Beginning in 1994, under the URAA and NAFTA, the U.S. opened its market to gradually increasing quantities of groundnut imports through a tariff-rate quota (TRQ) system. For edible groundnuts, the total TRQ in 2001 was 57,059 metric tons or 4 percent of domestic consumption, allocated to historical importers (e.g., Argentina 77 percent, Mexico 7.4 percent) and then on a first-come, first-serve basis (table 8). In-quota tariffs for edible and prepared groundnuts range between 6.6 to 9.35 cents per kilogram while out-of-the quota tariffs are very high, ranging between 131.8 percent and 163 percent under URAA (Table 9)⁷.

Table 8. US edible groundnut TRQ allocation

Year	Argentina URAA TRQ	Mexico NAFTA TRQ	Other URAA TRQ	Total NAFTA + URAA
1995	26,341	3,478	4,052	33,871
1996	29,853	3,582	5,043	38,478
1997	33,364	3,690	6,034	43,088
1998	36,877	3,801	7,024	47,702
1999	40,388	3,915	8,015	52,318
2000	43,901	4,032	9,005	56,938
2001	43,901	4,153	9,005	57,059
2002	43,901	4,278	9,005	57,184
--	43,901	4,278	9,005	--
2008	43,901	unrestricted	9,005	--

Source: Uruguay Round Agricultural Negotiation, USA, Revised Country Schedule and NAFTA

Table 9. US over-the-quota tariffs

	NAFTA	URAA
Year	Edible & Prepared Groundnut	Prepared & Peanut Butter
Base	123.1	155
1994	120	
1995	116.9	151.1
1996	113.9	147.3
1997	110.8	143.4
1998	107.7	139.5
1999	104.6	135.7
2000	93	131.8
2001	81.4	131.8
2002	69.8	131.8
2008	0	

Source: Uruguay Round Agricultural Negotiation, USA, Revised Country Schedule and NAFTA

Note: Prepared groundnut = roasted, salted, flavored ground

⁷ The levels of quota and tariff for the period post-2003 are currently under negotiation.

Phase out of groundnut trade barriers under NAFTA and URAA is limited in scope, but it continues to have a dramatic impact on U.S. imports. From virtually no imports to the U.S. prior to 1994, edible groundnut imports have increased dramatically (Table 10). Argentina and Mexico averaged a fill rate of 87 and 77 percent respectively, but over-of-the quota imports were quite important, averaging 25,000 tons over the last six years. Edible groundnut imports comprised 6 percent of U.S. total domestic consumption of groundnuts in 2001.

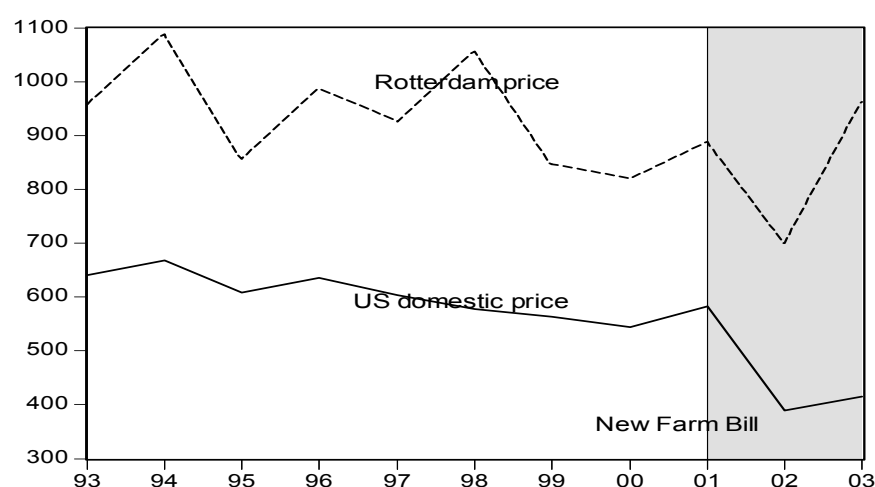
Table 10. US Imports of edible groundnuts

year	Argentina		Mexico		Total Import	Total Quota	Over-the-Quota Imports
	Import	Quota	Import	Quota			
1996	38270	29853	4710	3583	57000	38478	18522
1997	40622	33365	6148	3690	64000	43088	20912
1998	34465	36875	4834	3801	70000	47702	22298
1999	39494	40388	4916	3915	82000	52318	29682
2000	72230	43901	4864	4032	97000	56938	40062
2001	37557	43901	3611	4153	81000	57059	23941
2002	29927	43901	4406	4278	46795	57184	Not filled
2003	4692	43901	292	4278	5698	57184	Not filled

Source: USDA

The initial impacts of the new Farm bill are also visible here with the collapse of imports in 2003 (Table 10). The elimination of production quotas decreased the price paid by US processors and thus, increased domestic use of groundnuts (Figure 8). It also removed the incentive to import edible groundnuts.

Figure 8. The decline in US domestic groundnut prices after the Farm Bill 2001



Groundnut Policies in India, China, and Argentina

For India, China and Argentina, a general trend since the mid-1990s is a gradual reduction of potentially market-distorting direct government intervention in production and marketing of groundnut products. However, in response to declines in groundnut product prices,

India has intensified its use of trade policy measures to protect its producers and processors. India is now the largest source of distortions in these product markets, but China is also a significant source of distortions in the groundnut oil market, because of its size relative to other countries present in these markets.

India removed most restrictions on domestic trade (inter-state), storage, and export of groundnuts by 1998, and permitted trading in groundnut futures. However, import tariff levels remain very high for all the three groundnut products considered here. As Table 12 shows, tariffs on edible groundnut and groundnut meal stood at 45 percent, while that of groundnut oil was 35 percent in 2001. Since 2002, India has reversed its trade liberalization course on vegetable oil and has increased its applied tariffs on groundnut oil to 65-75 percent in 2002/3 and 85 percent for 2003/4 (Gulati, Pursell, and Mullen; and Pursell). The bound tariff is 100 percent.

Furthermore, additional regulatory burdens increase domestic costs and prices. One example is the obligation to sell and purchase groundnut only in the “Agricultural Produce Wholesale Market.”⁸ Another example of costly legislation is the “small-scale reservation” policy in groundnut processing, which sets limits on fixed assets in plant and machinery and thus prevents the domestic processing industry from realizing economies of scale.

As in India, China liberalized groundnut trade to some degree in recent years. Imports of groundnut are now opened to private firms while prior to 1999, only six public agencies imported groundnut products. However, while the government has committed to cap and reduce trade-distorting domestic subsidies as part of its WTO accession commitments, guaranteed prices and government procurement schemes remained in place⁹. Furthermore, groundnut border protection remains high in China for processed groundnut (30%). The tariff on raw groundnut was only 15 percent in 2001 and many regions of China are natural exporters of groundnuts making the tariff redundant. In-quota tariffs on groundnut oil and groundnut meal were much lower, at 10 and 5.0 percent, respectively. One has however to factor in the issue of reported uneven application of the Chinese value-added tax (VAT) on imported and domestic products (USDA Attaché reports). The VAT is significant, ranging between 13 to 17 percent depending on the product; there is ample room for tax evasion (USDA FAS [a]; USDA FAS [b]), and the non-uniformity in application prevents a more accurate measure of the impact. Our policy analysis considers several cases with and without the VAT included in the trade barriers.

China’s State trading imposes quantitative restrictions through quotas and licenses on groundnut oil imports and imposes tariff barriers on seeds, meal, and oil. These barriers create a wedge between domestic and world market prices. Domestic prices of most oils including groundnut oil are significantly higher than international market prices. Tariffs and rents on import licenses explain price differentials between domestic and CIF prices. For example, the international price of groundnut oil in Hong Kong for 1998 was U.S. \$728 per ton while the corresponding wholesale price in China was 67.8 percent higher (Fang and Beghin 2002).

⁸ This legislation is costly to both farmers and processors because even if they are located very close to each other geographically, they all have to travel to the wholesale market, pay an “agent commission” and other marketing fees before the transaction is processed.

⁹ According to FAO, these policies provide little incentive to expand production due to unattractive administrative price levels and greater involvement of private sector in marketing operations. Data on the size of domestic support is not available.

Table 13. Groundnut trade policies distortions in India, China and Argentina (%)

Country	Product	Description	1999/2002
India	Edible groundnuts	Import tariff	45
	Groundnut oil	Import tariff	35 ¹
	Groundnut meal	Import tariff	45
China	Raw edible groundnuts	Import tariff	15
	Processed edible groundnut	Import tariff	30
	Groundnut oil	Import tariff	10
	Groundnut meal	Import tariff	5
	VAT on edible groundnuts and gr. oil	VAT	17
Argentina	Edible groundnuts	Import tariff	5
	Groundnut oil	Import tariff	13
	Groundnut meal	Import tariff	8
	Edible groundnuts	Export tax	3.5
	Groundnut meal	Export rebate	3.2
	groundnut oil (refined)	Export rebate	2.3

Source: WTO, WITS. USDA GAINS Report 1. Note: (1) India raised its tariff on oil to 65% in 2002 and 85% in 200.

Raw edib. gr. =raw, not roasted or cooked, in shell or shelled gr.

Processed groundnuts = Bleached, preserved or otherwise prepared gr., incl. Roasted, salted. gr. butter

Argentina's groundnut trade policy contrasts sharply with that of India and China, as almost all the distortions are associated with exports, with a 3.5 percent tax on exported raw groundnuts. With the peso devaluation of 2001, export retention on groundnut increased to 20 percent. This export tax may countervail the positive signal sent to groundnut exporters through the peso devaluation. Argentina maintains import tariffs on groundnut products, which exhibit some escalation (5, 8 and 13 percent on edible groundnut, meal, and oil, respectively). These tariffs are frequently redundant since the country is a net exporter of groundnut products.

Groundnut Policies of Key African Exporters

After decades of extensive intervention in the groundnut sector, African countries have, to a varying degree, undergone market reforms in the 1980s under structural adjustment plans (SAP). One of the main objectives of market reforms was to eliminate direct and indirect taxation of farmers that had undermined production incentives in the 1970s and early 1980s, and that led to underutilized processing capacities in many groundnut producing countries (Badiane and Kinteh 1994). Reforms have been piecemeal and partial. Governments have generally withdrawn from input markets, leading to difficult access to inputs (chiefly certified seeds and fertilizer) where important market failures (e.g., in the credit market) and high transaction costs prevailed, as in Senegal and Gambia (Akobundu 1998). Governments have however been reluctant to liberalize groundnut processing, for which privatization efforts started only recently (Senegal, Gambia). In Senegal and Gambia, producer prices are still set by governments.

African governments have traditionally used pricing policies as levers to conveniently tax or subsidize farmers based on countries' industrial policy and political circumstances¹⁰. Taxation of groundnut farmers was high in the 1970's but has been reversed since the early 1990's in most countries while real world prices have trended downward (Badiane and Kinteh 1994). In Senegal

¹⁰ Taxation of producers was direct, i.e., when marketing boards or similar agencies captured the rent equals to the difference between net world price and producer price, or indirect, via real exchange rate appreciation. This taxation was generally mitigated by input subsidies and border protection.

and Gambia, the main rationale for state intervention in the groundnut sector has been to safeguard the viability of state-owned processing mills. Consequently, the share of the export price to groundnut farmers has consistently been less than 60 percent in these two countries. This policy has been counter-productive for the state-owned enterprises, since farmers have bypassed large public processing companies, creating excess capacities and financial difficulties.

With regard to trade policies, there are wide differences among African traditional groundnut exporters. Senegal and Malawi apply high tariffs on processed groundnuts, to encourage in-country processing (oil production in the case of Senegal) (Table 14). In contrast, Gambia and Nigeria have a liberal trade policy, with no export taxes or import tariffs. South Africa's tariff structure exhibits a slight escalation, with processed groundnuts subject to a tariff of 6 percent while unprocessed groundnuts enter duty free. In Senegal and Gambia however, unofficial cross-border trade is significant, with farmers frequently crossing the border to and from Senegal, depending mainly on respective producer prices and domestic supply levels. Oil imports face a 20 percent tariff in Senegal, South Africa and Malawi.

Table 14. Tariffs on groundnut products in major African producers (%)

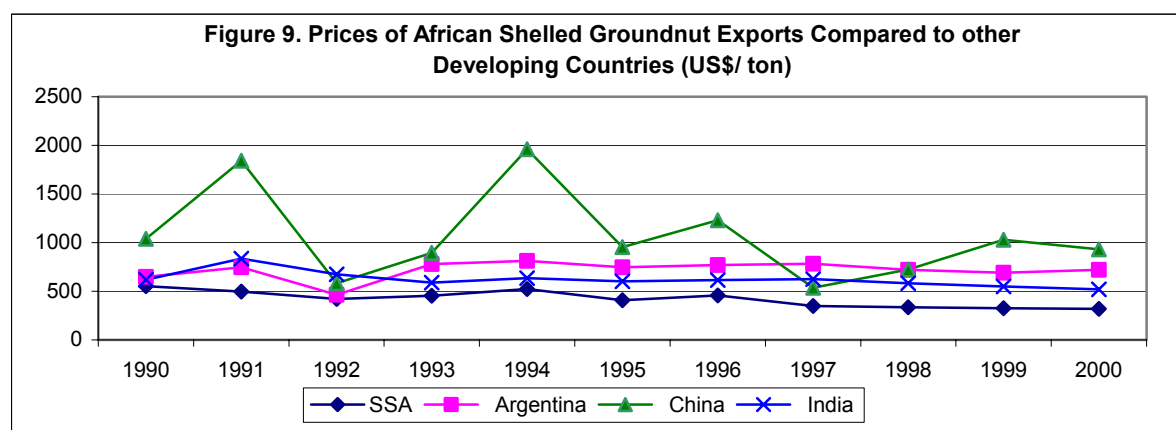
Country	Product	1999/2002
Senegal	Raw edible groundnut	5
	Processed edible groundnut	20
	Groundnut meal	0
	groundnut oil (refined)	20
Nigeria	Edible groundnuts	0
	Groundnut meal	0
	groundnut oil (refined)	0
The Gambia	Edible groundnuts	0
	Groundnut meal	0
	groundnut oil (refined)	0
South Africa	Raw edible groundnut	0
	Processed edible groundnut	6
	Groundnut meal	0
	groundnut oil (refined)	20
Malawi	Raw edible groundnut	5
	Processed edible groundnut	25
	Groundnut meal	0
	groundnut oil (refined)	20

Source: WTO Database. Note: Raw edib. gr. =raw, not roasted or cooked, in shell or shelled gr.

Processed groundnuts = Bleached, preserved or otherwise prepared gr., incl. Roasted, salted. gr. butter

The EU has harmonized country regulations of maximum permissible level of aflatoxin in 1998, and has fixed maximum levels of aflatoxin to the lowest possible level (e.g., 0.002-milligram for B1 type aflatoxin for edible groundnuts). Technical processes exist to reduce aflatoxin contamination (e.g., through ammoniac as used in Senegal for groundnut meal) but the best method is to improve farm practices through use of the best quality and resistant seeds, proper management of farms, and appropriate storage to avoid exposure to high temperature and humidity. African countries also face difficulties in meeting stricter product and quality standards. In Senegal and Gambia, groundnut varieties were originally selected for oil production, which can accommodate lower quality seeds and raw groundnuts. A seed variety in Malawi proved successful in better yields, but lacked commercially viable characteristics. These problems transpire in the international prices of African origin, which are discounted compared

to high quality groundnut sold in the EU market (Figure 9).



Source: Oil World

Shifting out of groundnut oil and upgrading the quality of edible groundnut may be an option for African producers. Unlike demand for oil and meal, demand for confectionary groundnut (the higher quality edible groundnut) has been rising and is expected to continue to increase in the medium term. At the same time, confectionary groundnuts receive a price premium that can be as high as 100 percent compared to grades used for oil and meal. In Senegal, one ton of first grade confectionery groundnut sells for \$800 to \$900, which is equivalent to the price of groundnut oil. It takes, however, three tons of unshelled groundnuts to produce one ton of oil. Similarly, prices of Gambian groundnuts are about \$300, \$450 and \$600 FOB for (crushing), bird food and edible respectively. Were Gambia able to upgrade 50 percent of its 10,000 tons of exports from crushing to edible, the increased revenue would be \$1.5 million.

Groundnut Trade Policies of High-income Importers

In spite of a general pattern of tariff escalation, barriers to groundnut are not a major obstacle in high-income major importers: the two largest groundnut importers in this category, the EU and Canada, have a zero tariff for unprocessed groundnut and low processed groundnut tariffs for GSP and LDC countries (Table 15). Assessment of market access in these countries should however take into account the strict quality standards. In contrast to the EU and Canada, Japan and Korea have a high tariff regime for groundnuts. Japan applies a high tariff on processed groundnuts and it offers a very limited preference margin of 4 percent for groundnut exports from LDC. Korea has very high tariffs on both raw and processed groundnuts, with tariffs on the former standing at more than 200 percent. This high tariff on raw groundnut may reflect the government desire to stimulate production, which has plummeted over the past 15 years. In contrast to edible groundnuts, groundnut oils and meal enter into all these high-income countries duty free.

Table 15. Simple average tariffs on edible groundnuts, unprocessed and processed

	MFN Tariffs		GSP Tariffs		LDC Tariffs	
	Unprocessed	Processed	Unprocessed	Processed	Unprocessed	Processed
EU	0%	13%	0%	9%	0%	0%
Japan	3.7%	19%	3.7%	19%	3.7%	15%
Canada	0%	4%	0%	4%	0%	3.2%
Korea	243%	65%	243%	65%	243%	65%

Source: WTO

IV. IMPACT OF GROUNDNUT PRODUCT POLICY REFORMS ON WORLD PRICES, TRADE FLOWS AND WELFARE

We summarize key findings of our quantitative analysis of distortions in groundnut markets (see Beghin, Diop, Matthey, and Sewadeh 2003). A full description of the model and further details can be found in the latter reference. We first report results obtained under the most plausible assumptions underlying the model. We later discuss sensitivity analysis which concerns US policy and the uncertainty on China's protection (VAT and protection of processed groundnuts).

Policy Reform Scenarios

We analyze multiple scenarios. First, we consider full multilateral trade liberalization for groundnuts, meal, and oil, with and without the removal of the U.S. peanut program. We call these two scenarios FMTL&US, and FMTL. Then we consider multilateral groundnut trade liberalization, again with and without the removal of the U.S. farm peanut program (GMTL&US, and GMTL scenarios). We then consider full trade liberalization in the two largest and most distorted groundnut markets, China and India (CIFTL scenario). We report results on these key five scenarios in Tables 16 to 21. All results regarding changes in price and physical flows are reported in percent change from the baseline, Tables 16-20. Changes in welfare are reported in 1995 PPP U.S. dollars (purchase power parity holding in 1995) in Table 21. The baseline and simulations were run for 3 years (1999-2001), and averaged. We report the 3-year average impacts in the last column of the tables.

Results

In countries characterized by high groundnut protection, the combined effect of the world price increase and removal of their own protection is beneficial to final users of groundnuts, other things being equal. For countries with moderate or no protection prior to reform, the net impact (tariff removal and terms of trade) is an increase in domestic groundnut prices, handicapping groundnut users (final consumers, crushers), other things being equal. A similar logic and dichotomy of cases carries through for groundnut oil and meal for which the combined effect of world price and tariff removal has to be assessed. These substantial terms-of-trade effects have a large impact on trade and welfare. Allocative efficiency gains in domestic markets can be offset by large price increases originating in post-reform world markets.

Further, in countries with high protection of the oil and/or meal sectors (e.g., India), the oil and cake tariff removal, net of the world price hike, induces lower domestic prices for these two products and reduces crush margins. As a result, the domestic excess supply of groundnut crushed into oil and cake decreases, drawing imports. By contrast, countries with moderate or no

protection in their oil and cake markets face a net price increase for oil and cake after full trade liberalization. Their final consumption of these value-added products decreases, and crushing increases as their crush margin improves with the reform. Their excess supply of these products increase and they exhibit larger exports.

The two full trade liberalizations scenarios with and without the removal of U.S. farm policy, FMTL&US and FMTL, bring strong price increases for all three products, 10 percent for groundnuts, 18 percent for groundnut cake, and 27 percent for groundnut oil, as shown in Tables 16 and 17. The welfare impact of the FMTL&US and FMTL reforms is influenced by the change in the groundnut oil price, which affects the crush margin. Specifically, crush margins deteriorate in the EU and India, decreasing supply. However, margins improve in China, Gambia, Nigeria, Senegal, South Africa and the USA.

As shown in Tables 16 and 17, trade patterns change dramatically. China expands its exports of the three products. The high increase in the price of oil improves the crush margin and stimulates crush in China. Higher prices for groundnut oil in the world markets translates into larger exports. In India the lower crush margin reduces oil and meal production; lower consumer prices for all groundnut products stimulate oil and feed demand and eventually imports to meet the need associated with the liberalized price level. African producers expand their exports of value-added products. Senegal and Malawi decrease their exports of groundnuts because of larger domestic use, India experiences trade reversal becoming a large importer of groundnut oil and cake. Accounting for the trade reversals in Table 16 and 17, aggregate trade in groundnuts increases by 16 percent, and trade in value-added products more than doubles.

The first two columns of Table 21 show the welfare impact of these two reforms. The aggregate net welfare effects of FMTL&US and FMTL amount to about 791 million dollars at 1995 prices in each scenario, respectively. China and India experience the largest welfare gains, not surprisingly since they have the two largest and most distorted groundnut product markets. China's welfare gains are about 666 million dollars, whereas India's gains are about 213 million dollars. The "moderate" world welfare effect first comes from offsets--some countries gain in aggregate whereas some others lose, chiefly the EU-15. Further, for many countries other than China and India, individual net gains/losses are moderate, mostly because of the small size of the three groundnut markets and their price-inelastic nature, which bring large transfers but small deadweight losses. Indeed, substantial transfers occur between consumers, crushers, and producers. These transfers offset each other.

Price effects induced by the reforms have a similar impact (large welfare rectangles and small triangles), including in countries with undistorted markets. For example in Nigeria, following FMTL, groundnut producers gain 34 million dollars of quasi-rents; consumers experience welfare losses of 65 million dollars because of higher oil and processed groundnut prices; crushers gain 51 million dollars; meal users (feed users) lose about 3 million dollars. The country in aggregate is better off by 16 million dollars.

Under multilateral trade liberalization for all three products, the removal of the U.S. program has impact on trade flows, terms of trade or welfare. The strong price effects of trade liberalization invalidate the price floor established by the U.S. loan rate. The only remaining production-distorting element is the fixed payment (fully coupled in our model), which is small. Results under both scenarios (full trade liberalization, FMTL) and FMTL&US) are qualitatively identical, except for the USA, which experience additional welfare gains of 3.5 million dollars for the removal of its domestic distortions (gains to U.S. taxpayers net of losses of U.S.

producers). The world price impacts of the FMTL scenario are identical to those of FMTL&US (10%, 18% and 27% respectively for groundnuts, cake and oil). Similarly trade flows are barely affected by the removal of the US domestic program under free trade. U.S. peanut exports are about 15,000 mt lower in the FMTL&US scenario as compared to their level in the FMTL scenario. Given that our parameterization of US farm policy assumes full coupling of payments received by producers to production, our assessment provides an upper bound on the effect of the current U.S. peanut program.¹¹

Many debates of the Doha round of the WTO revolve around narrow agricultural negotiations of substantial importance to developing countries. Hence, it is useful to assess what a narrow agricultural liberalization would achieve relative to a full trade liberalization encompassing the value-added products of groundnut oil and cake. The GMTL&US, and GMTL scenarios consider these reforms and their impacts, with results shown in Tables 18 and 19 and in the third and fourth columns of Table 21. Much is achieved by groundnut trade liberalization alone, but with a large second-best component since distortions are present in the value-added markets. In these groundnut liberalization scenarios, the price of cake and oil is little affected and crush margins are primarily affected by changes in groundnut prices. Margins improve in India, but deteriorate in countries with limited groundnut distortions. Consumer welfare implications are also different in these trade scenarios. In highly protected groundnut oil markets, prices are higher under the groundnut trade scenarios (GMTL scenarios) than they are under all-product trade liberalization (FMTL scenarios). In countries with no oil distortions, prices roughly remain as their baseline level and consumers do better under the groundnut trade liberalization than under FMTL scenarios. For the latter reason, the rest of the world fares much better under GMTL scenarios than under the FMTL scenarios.

By contrast African economies do much better with the FMTL scenarios than with groundnut trade liberalization reforms. The potential Africa-5 welfare gains nearly double moving from GMTL scenarios to FMTL ones.¹²

If China and India liberalized alone (CIFTL scenario), the qualitative results of the FMTL scenarios would hold. What is striking in this last scenario is the importance of India's and to a lesser extent China's distortions and market size in the welfare, trade, and price effects. As suggested by Table 18 and the last column of Table 20, FMTL really hinges on the removal of distortions in China and India. With the implementation of CIFTL, world price increases for the three products would be substantial: 8 percent for groundnuts, 18 percent for meal, and 26 percent for oil. The major welfare differences occur in the Rest of the World where consumers do worse than they would under the GMTL, since oil prices are higher. Africa-5 improves its lot in aggregate but not as well as it would under the FMTL scenario, since groundnut prices are not as high and because Africa-5 own distortions are still in place.

¹¹ We also ran a U.S. distortion removal scenario under existing trade distortions. We obtain a 0.13% increase in the world price of peanuts and virtually no increase in world cake and oil prices. U.S. peanut exports decrease by 10 percent or about 20,000 mt. Hence unlike in the case of some other commodities subsidized by U.S. taxpayers and consumers (e.g., rice, cotton, sugar), the impact of the current U.S. farm program on peanut world price and trade is nearly negligible.

¹² Africa-5 denotes our aggregate of the Gambia, Malawi, Nigeria, Senegal, and South Africa.

Table 16. Full trade liberalization and removal of US farm policy (FMTL&US scenario)

	new levels after reform			baseline levels			average change
	99/00	00/01	01/02	99/00	00/01	01/02	for 3 years
Peanuts Trade (1000mt)							
Net Exporters							
Argentina	241	190	196	226	177	185	7%
China	699	659	687	540	450	525	36%
Gambia	9	12	17	8	11	15	11%
India	89	-1	33	100	100	125	-62%
Malawi	0	1	1	2	3	3	-80%
Nigeria	30	39	42	0	0	0	3667%
Senegal	-5	-10	-3	2	4	5	-287%
South Africa	26	20	38	20	16	35	22%
USA	272	162	234	255	141	231	8%
Total Net Exports	1361	1072	1245	1153	902	1124	16%
Net Importers							
Canada	111	102	105	116	107	110	-5%
European Union	441	428	448	457	441	463	-3%
Mexico	94	65	69	101	72	75	-8%
Rest of the World	525	467	563	290	272	415	63%
Residual	189	10	61	189	10	61	0%
Total Net Imports	1361	1072	1245	1153	902	1124	16%
Peanuts Price US Run. 40/50 CIF Rotter	896	972	779	820	888	700	10%
Peanut Meal Trade (1000 mt)							
Net Exporters							
Argentina	73	54	63	67	50	52	13%
China	111	119	124	9	15	25	741%
Gambia	7	12	11	5	10	10	22%
India	-311	-297	-212	10	20	100	-1702%
Malawi	0	0	0	0	0	0	9%
Nigeria	26	26	34	0	0	0	2867%
Senegal	137	151	145	130	144	140	5%
South Africa	-4	2	1	-5	0	0	95%
USA	33	29	31	6	5	5	484%
Rest of the World	134	136	103	8	14	-12	499%
Total Net Exports	206	233	300	230	258	320	-9%
Net Importers							
European Union	162	169	158	186	194	178	-12%
Residual	44	64	142	44	64	142	0%
Total Net Imports	206	233	300	230	258	320	-9%
Meal Price 48/50% CIF Rotterdam \$/mt	144	159	147	122	134	125	18%
Peanut Oil Trade (1000 mt)							
Net Exporters							
Argentina	49	44	50	46	41	42	11%
China	55	64	76	0	5	2	3469%
Gambia	5	6	6	0	0	0	589%
India	-238	-225	-266	0	0	0	-24288%
Malawi	0	0	1	0	0	0	43%
Nigeria	72	72	77	35	35	30	123%
Senegal	102	108	114	98	102	109	5%
South Africa	0	1	1	0	0	0	49%
USA	23	-18	6	2	-30	-10	288%
Rest of the World	114	103	105	18	11	8	861%
Total Net Exports	185	155	170	199	164	181	-6%
Net Importers							
European Union	136	101	109	150	110	120	-9%
Residual	49	54	61	49	54	61	0%
Total Net Imports	185	155	170	199	164	181	-6%
Peanut Oil Price CIF Rotterdam \$/mt	933	866	851	744	685	659	27%
welfare(million dollars)	690	920	763				791

Table 17. Full trade liberalization (FMTL scenario)

	new levels after reform			baseline levels			average change for 3 years (%)
	99/00	00/01	01/02	99/00	00/01	01/02	
Peanuts Trade (1000 mt)							
Net Exporters							
Argentina	241	190	195	226	177	185	6%
China	693	655	678	540	450	525	34%
Gambia	9	12	17	8	11	15	11%
India	87	-1	29	100	100	125	-64%
Malawi	0	1	1	2	3	3	-82%
Nigeria	29	38	40	0	0	0	3564%
Senegal	-6	-10	-4	2	4	5	-298%
South Africa	26	20	38	20	16	35	22%
USA	287	169	259	255	141	231	15%
Total Net Exports	1367	1075	1254	1153	902	1124	16%
Net Importers							
Canada	111	102	105	116	107	110	-5%
European Union	442	428	448	457	441	463	-3%
Mexico	94	65	69	101	72	75	-8%
Rest of the World	531	470	571	290	272	415	65%
Residual	189	10	61	189	10	61	0%
Total Net Imports	1367	1075	1254	1153	902	1124	16%
Peanuts Price US Run. 40/50, CIF Ro	895	972	778	820	888	700	10%
Peanut Meal Trade (1000 mt)							
Net Exporters							
Argentina	73	54	63	67	50	52	13%
China	111	119	123	9	15	25	739%
Gambia	7	12	11	5	10	10	21%
India	-311	-297	-212	10	20	100	-1703%
Malawi	0	0	0	0	0	0	8%
Nigeria	26	26	34	0	0	0	2862%
Senegal	137	151	145	130	144	140	5%
South Africa	-4	2	1	-5	0	0	95%
USA	33	29	32	6	5	5	487%
Rest of the World	135	137	103	8	14	-12	499%
Total Net Exports	206	233	300	230	258	320	-9%
Net Importers							
European Union	162	169	158	186	194	178	-12%
Residual	44	64	142	44	64	142	0%
Total Net Imports	206	233	300	230	258	320	-9%
Meal Price 48/50% CIF Rotterdam \$	144	159	147	122	134	125	18%
Peanut Oil Trade (1000 mt)							
Net Exporters							
Argentina	49	44	50	46	41	42	11%
China	55	64	76	0	5	2	3459%
Gambia	5	6	6	0	0	0	587%
India	-238	-225	-266	0	0	0	-24304%
Malawi	0	0	1	0	0	0	43%
Nigeria	72	72	77	35	35	30	123%
Senegal	102	108	114	98	102	109	5%
South Africa	0	1	1	0	0	0	49%
USA	24	-17	6	2	-30	-10	290%
Rest of the World	115	103	105	18	11	8	864%
Total Net Exports	185	155	170	199	164	181	-6%
Net Importers							
European Union	136	101	109	150	110	120	-9%
Residual	49	54	61	49	54	61	0%
Total Net Imports	185	155	170	199	164	181	-6%
Peanut Oil Price CIF Rotterdam \$/mt	933	866	851	744	685	659	27%
welfare(million dollars)	691	924	757				791

Table 18. Peanut trade liberalization and removal of US peanut program (GMTL&US scenario)

	new levels after reform			baseline levels			average change for 3 years
	99/00	00/01	01/02	99/00	00/01	01/02	
Peanuts Trade (1000 mt)							
Net Exporters							
Argentina	260	208	249	226	177	185	22%
China	748	703	688	540	450	525	42%
Gambia	11	15	18	8	11	15	31%
India	-482	-553	-415	100	100	125	-556%
Malawi	-1	1	1	2	3	3	-93%
Nigeria	68	75	82	0	0	0	7470%
Senegal	4	2	2	2	4	5	-8%
South Africa	25	20	38	20	16	35	20%
USA	355	244	301	255	141	231	48%
Total Net Exports	989	714	962	1153	902	1124	-17%
Net Importers							
Canada	112	102	106	116	107	110	-4%
European Union	440	426	449	457	441	463	-3%
Mexico	95	66	70	101	72	75	-7%
Rest of the World	153	109	275	290	272	415	-47%
Residual	189	10	61	189	10	61	0%
Total Net Imports	989	714	962	1153	902	1124	-17%
Peanuts Price US Run. 40/50, CIF Rotterdam	884	960	759	820	888	700	8%
Peanut Meal Trade (1000 mt)							
Net Exporters							
Argentina	64	47	47	67	50	52	-6%
China	-11	-9	12	9	15	25	-144%
Gambia	5	10	10	5	10	10	-2%
India	71	95	151	10	20	100	344%
Malawi	0	0	0	0	0	0	1%
Nigeria	-2	-2	-2	0	0	0	-193%
Senegal	129	143	140	130	144	140	-1%
South Africa	-5	0	0	-5	0	0	-7%
USA	-14	-18	-13	6	5	5	-380%
Rest of the World	-7	-5	-25	8	14	-12	-70%
Total Net Exports	231	260	320	230	258	320	0%
Net Importers							
European Union	187	196	178	186	194	178	1%
Residual	44	64	142	44	64	142	0%
Total Net Imports	231	260	320	230	258	320	0%
Peanut Meal Price 48/50% CIF Rotterdam	122	133	125	122	134	125	0%
Peanut Oil Trade (1000 mt)							
Net Exporters							
Argentina	44	39	38	46	41	42	-6%
China	-13	-11	-7	0	5	2	-705%
Gambia	0	0	0	0	0	0	-5%
India	45	55	38	0	0	0	4591%
Malawi	0	0	0	0	0	0	0%
Nigeria	33	32	28	35	35	30	-6%
Senegal	97	101	109	98	102	109	-1%
South Africa	0	0	0	0	0	0	-4%
USA	-14	-48	-24	2	-30	-10	-194%
Rest of the World	7	-3	-2	18	11	8	-103%
Total Net Exports	200	165	181	199	164	181	0%
Net Importers							
European Union	151	111	120	150	110	120	0%
Residual	49	54	61	49	54	61	0%
Total Net Imports	200	165	181	199	164	181	0%
Peanut Oil Price CIF Rotterdam \$/mt	747	686	664	744	685	659	0%
welfare (million dollars)	782	1024	799				868

Table 19. Impact of peanut trade liberalization (GMIL scenario)

	new levels after reform			baseline levels			average change
	99/00	00/01	01/02	99/00	00/01	01/02	for 3 years
Peanuts Trade							
Net Exporters							
Argentina	260	208	248	226	177	185	22%
China	742	699	678	540	450	525	41%
Gambia	11	15	18	8	11	15	30%
India	-483	-554	-419	100	100	125	-557%
Malawi	-0.6	0.7	0.6	2	3	3	-95%
Nigeria	67	74	80	0	0	0	7358%
Senegal	3	2	2	2	4	5	-20%
South Africa	25	20	37	20	16	35	20%
USA	371	253	327	255	141	231	55%
Total Net Exports	995	717	972	1,153	902	1,124	-16%
Net Importers							
Canada	112	102	106	116	107	110	-4%
European Union	440	426	449	457	441	463	-3%
Mexico	95	66	70	101	72	75	-7%
Rest of the World	159	112	285	290	272	415	-45%
Residual	189	10	61	189	10	61	0%
Total Net Imports	995	717	972	1,153	902	1,124	-16%
Peanuts Price: US Runners 40/50, CIF Rotterdam	883	959	758	820	888	700	8%
Peanut Meal Trade							
Net Exporters							
Argentina	64.42	46.98	47.23	67.00	50.00	52.00	-6%
China	-10.71	-9.49	11.42	9.00	15.00	25.00	-146%
Gambia	4.87	9.81	9.92	5.00	10.00	10.00	-2%
India	70.15	94.53	150.54	10.00	20.00	100.00	342%
Malawi	0.00	-0.03	0.06	0.00	0.00	0.00	1%
Nigeria	-1.89	-2.37	-1.64	0.00	0.00	0.00	-196%
Senegal	129.18	142.68	139.58	130.00	144.00	140.00	-1%
South Africa	-5.09	-0.19	-0.05	-5.00	0.00	0.00	-7%
USA	-13.70	-17.66	-12.35	6.00	5.00	5.00	-376%
Rest of the World	-6.06	-4.64	-24.20	8.00	14.00	-12.00	-69%
Total Net Exports	231.18	259.63	320.50	230.00	258.00	320.00	0.4%
Net Importers							
European Union	187	196	179	186	194	178	1%
Residual	44	64	142	44	64	142	0%
Total Net Imports	231	260	321	230	258	320	0%
Peanut Meal Price: 48/50% CIF Rotterdam	122	133	125	122	134	125	0%
Peanut Oil Trade							
Net Exporters							
Argentina	44	39	38	46	41	42	-6%
China	-13	-12	-7	0	5	2	-713%
Gambia	-0.07	-0.16	0.04	0	0	0	-6%
India	44	55	38	0	0	0	4558%
Malawi	-0.006	-0.027	0.023	0.000	0.000	0.000	0%
Nigeria	33	32	28	35	35	30	-6%
Senegal	97	101	109	98	102	109	-1%
South Africa	0	0	0	0	0	0	-4%
USA	-13	-48	-23	2	-30	-10	-192%
Rest of the World	8	-3	-1	18	11	8	-99%
Total Net Exports	200	165	181	199	164	181	0%
Net Importers							
European Union	151	111	120	150	110	120	0%
Residual	49	54	61	49	54	61	0%
Total Net Imports	200	165	181	199	164	181	0%
Peanut Oil Price: CIF Rotterdam	746	686	664	744	685	659	0%
Welfare (million dollars)	783	1,028	795				869

Table 20. Impact of China and India full liberalization (CIFTL scenario)

	1999/2000	New levels after reform		1999/2000	baseline levels		average change for 3 years (%)
		2000/01	2001/02		2000/01	2001/02	
Peanuts Trade							
Net Exporters							
Argentina	223	174	160	226	177	185	-6%
China	586	531	589	540	450	525	13%
Gambia	8	11	16	8	11	15	3%
India	55	-38	0	100	100	125	-94%
Malawi	4	5	5	2	3	3	84%
Nigeria	12	19	22	0	0	0	1776%
Senegal	-24	-19	-9	2	4	5	-708%
South Africa	24	19	37	20	16	35	14%
USA	258	142	238	255	141	231	2%
Total Net Exports	1147	845	1058	1153	902	1124	-4%
Net Importers							
Canada	112	103	106	116	107	110	-4%
European Union	448	433	453	457	441	463	-2%
Mexico	96	67	70	101	72	75	-6%
Rest of the World	302	232	369	290	272	415	-7%
Residual	189	10	61	189	10	61	0%
Total Net Imports	1147	845	1058	1153	902	1124	-4%
Peanuts Price US \$/mt, CIF Rotterdam \$/mt	877	952	763	820	888	700	8%
Peanut Meal Trade							
Net Exporters							
Argentina	76	57	67	67	50	52	18%
China	114	122	126	9	15	25	759%
Gambia	7	12	11	5	10	10	22%
India	-309	-294	-210	10	20	100	-1690%
Malawi	1	0	0	0	0	0	46%
Nigeria	26	26	34	0	0	0	2867%
Senegal	150	165	155	130	144	140	14%
South Africa	-3	3	2	-5	0	0	139%
USA	37	33	35	6	5	5	563%
Rest of the World	108	108	80	8	14	-12	385%
Total Net Exports	205	233	300	230	258	320	-9%
Net Importers							
European Union	161	169	158	186	194	178	-13%
Residual	44	64	142	44	64	142	0%
Total Net Imports	205	233	300	230	258	320	-9%
Meal Price 48/50% CIF Rotterdam \$/mt	144	159	147	122	134	125	18%
Peanut Oil Trade							
Net Exporters							
Argentina	51	45	53	46	41	42	16%
China	53	61	74	0	5	2	3354%
Gambia	5	6	6	0	0	0	567%
India	-240	-226	-269	0	0	0	-24481%
Malawi	2	2	2	0	0	0	185%
Nigeria	71	71	76	35	35	30	120%
Senegal	116	126	126	98	102	109	19%
South Africa	2	2	2	0	0	0	224%
USA	26	-14	9	2	-30	-10	326%
Rest of the World	92	79	85	18	11	8	665%
Total Net Exports	180	151	166	199	164	181	-8%
Net Importers							
European Union	131	97	105	150	110	120	-12%
Residual	49	54	61	49	54	61	0%
Total Net Imports	180	151	166	199	164	181	-8%
Peanut Oil Price CIF Rotterdam \$/mt	924	857	844	744	685	659	26%
Welfare effects (million \$)	765	1013	815	-	-	-	864

Table 21. Welfare effects of policy scenarios in million dollars at 1995 prices

(average 1999-2001)

Country	FMTL&US	FMTL	GMTL&US	GMTL	CIFIL
Argentina	16.07	15.94	9.97	9.84	12.66
EU-15	-51.83	-51.27	-34.40	-33.82	-58.87
China	666.25	668.76	650.65	653.33	716.25
India	213.27	214.11	196.57	197.79	228.59
Rest of the world	-126.69	-127.06	-4.21	-4.86	-71.06
Canada	-5.94	-5.87	-4.88	-4.81	-4.59
Mexico	-7.43	-7.34	-6.11	-6.01	-5.73
Senegal	41.03	40.96	21.93	21.86	21.39
Nigeria	15.93	15.77	7.22	7.07	13.45
South Africa	2.30	2.28	2.19	2.17	0.53
Malawi	7.45	7.45	7.60	7.61	-1.06
Gambia	0.43	0.42	0.24	0.24	0.36
USA	20.18	16.70	21.71	18.40	12.39
Africa-5 total ¹	67.14	66.89	39.18	38.95	34.67
Total	791.01	790.87	868.48	868.79	864.32

1. Denotes the aggregate of Senegal, Nigeria, South Africa, Malawi, and the Gambia.

We investigated two key assumptions in the model: the prevailing groundnut market price underlying the US market, and the level of protection of the groundnut markets in China. We calibrated the model on 2002/3 US prices (\$389/mt) to see if the new US policy would have had a stronger impact on the world market under lower prevailing prices. US farm prices in 2002/3 were 25 percent lower than in 2001/2. We remove the loan rate, counter-cyclical payments, and fixed payments (recall the latter two components are assumed fully coupled in our model to provide an upper bound on the effect of the US program), while holding all other distortions in place in all other countries. The price floor provided by the loan rate is effective under the lower 2002/3 farm price. US Output decreases by 7 percent under the new prices and US exports decreases by 52%, inducing a 0.9 percent increase in the world price of groundnuts and further negligible price impacts in the other markets. The aggregate net welfare effect is negligible and negative. Higher world prices exacerbate distortions in other markets or increase import costs in net-importing countries. The US gains about 22 million dollars (program cost savings net of the producer loss). We also tested the same change but with all other distortions removed in all countries (FMTL&US scenario). In this scenario, the world price levels of groundnuts was 0.5 percent higher than under free trade *cum* U.S. farm bill. We concluded that removing the farm bill incentives in a free trade world would decrease US production by about 4 percent and decrease its exports by 31 percent. The aggregate welfare gains vary by less than \$1 million. Hence, the conclusions that the new US groundnut policy is much more benign than its predecessor remains unaltered under much lower prices.

The sensitivity analysis on China's protection structure is more pivotal to the conclusions reached, especially the protection of the groundnut sector. We consider the following assumptions changes: the protection of groundnut producers is assumed to be 15 (tariff is redundant in the original model). The Chinese farm sector is no longer assumed to be a net exporter without assistance. Under this new assumption and following full trade liberalization (FMTL&US), China becomes a net importer of groundnuts because demands for edible and crush groundnuts increase. China's welfare gains are 1,029 million dollars. Aggregate welfare gains are 1160 million dollars. World prices increase by 18, 19, 29 percent for groundnuts, cake

and oil, respectively. We also lower the baseline protection of processed groundnuts to 15 percent ad-valorem tariff (original tariff was 30 percent and VAT was 17 percent). Under the latter assumptions, welfare gains from FMTL in China are only 266 million dollars and aggregate gains are 388 millions. The world price of groundnuts increases by 9 percent in this modified scenario compared to a 10 percent increase under the original run). The major change in welfare occurs in China because Chinese consumers gain much less from trade liberalization compared to the initial situation with original tariffs and VAT on processed groundnuts.

V. POLICY IMPLICATIONS AND CONCLUSIONS

The groundnut market is historically distorted by heavy government intervention in the North and the South. In the US, the 2002 Farm Bill has suppressed some unsustainable features of the previous policies, but has introduced new distortions with some limited potential to depress world market prices and subsidize U.S. groundnut exports. In India and China, governments have succeeded in stimulating production and exports, thereby capturing a growing share of the international market. These gains in India have been artificial because the entire groundnut industry relies on heavy protection. In contrast, in Sub-Saharan Africa (SSA) and in Argentina, government intervention has negatively affected the sector.

Following full trade liberalization, world market prices would increase by about 10 percent for groundnuts, 18 percent for meal, and 27 percent for oil. Trade in groundnuts would increase by 16 percent and trade in oil and meal would more than double, considerably expanding the global trade volume of these markets.

The current U.S. domestic peanut program is now mostly a U.S. domestic support program with minimal distortive impact, unlike U.S. domestic policy for other products such as cotton, dairy, rice, and sugar. Based on our scenarios, developing countries would gain little by “forcing” further U.S. groundnut policy reform. These changes would prove ineffective unless groundnut prices fall to very low levels. Only then would the U.S. policy further destabilize world prices given its anti-cyclical nature, and sending the wrong market signal to U.S. producers. Under prevailing market conditions, U.S. producers would actually benefit from multilateral trade liberalization in groundnut product markets. Hence, on the instance of groundnuts, it would be rational for the U.S. to support foreign groundnut producers in their attempt to liberalize. As a bloc, the most OECD countries would experience welfare losses after trade liberalization--moderate gains in the USA offset by losses in the EU-15, Canada and Mexico. Mexico, Canada, and the EU-15 would lose from the trade liberalization, because there are few distortions in these markets, so consumers are directly penalized by price increases for the groundnut products.

The removal of trade distortions by the two largest developing economies--India and to a lesser extent China-- is essential in the groundnut product markets. These two countries’ policies have the largest distorting effect on world prices for the three traded commodities considered in our analysis because of their market size and because of prohibitive distortions in the case of India. Their policies substantially depress the world prices of the three traded commodities. Following the removal of these distortions, net buyers of these products will be worse off. However, as we have shown, the countries of Sub-Saharan Africa that export groundnuts would mostly gain from full trade liberalization.

Although the net world welfare effects of liberalizing these three markets are moderate,

they remain significant for small agrarian economies in Sub-Saharan Africa. Hence in the context of poverty alleviation, liberalization creates welfare gains in countries where they are much needed.

The simulations also show that beyond agricultural trade liberalization, the liberalization of the value-added markets is essential to achieve larger welfare gains in African countries. Although the bulk of the world welfare gains occur with groundnut trade liberalization, the additional removal of distortions in value-added markets doubles net welfare gains in the African region via larger profits to groundnut and groundnut oil producers and exporters. African countries modeled in our trade liberalization analysis would experience aggregate welfare gains of 67 million dollars, with Senegal and Nigeria reaping most of these gains. Groundnut and groundnut oil consumers in Africa tend to be urban whereas groundnut production generates income in rural areas as a cash crop. In that respect, African groundnut producers modeled in our analysis gain between 50 and 150 million dollars of farm income depending on assumptions underlying the model. These figures are significant in the context of small African economies, and represent a significant opportunity to expand rural development in these areas. Also, in scenarios tested, the rest of the world would fare worse under full trade liberalization because consumers are required to pay higher groundnut product prices. However, groundnut is not without substitutes.

The recent changes present both challenges and opportunities to major countries in the market. The US is likely to continue to dominate the high end of the international confectionary market under the new program. The performance of China and Argentina show that both countries have established strong groundnut sectors that can compete favorably under free market conditions. Chinese exports have played a stabilizing role in world markets in the 1990s.

All developing countries, except Argentina, face a quality challenge for meeting the requirements of the expanding confectionary markets. This is particularly true for African countries. We did not attempt to model this aspect of the groundnut market, however our qualitative assessment of the groundnut market made this point clearly. Currently, the opportunities and rewards induced by the expansion of the edible groundnut exports market are eluding African producers to a large extent because of these quality issues.

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ANNEX.

I- Unit Root and Co-Integration Tests for Edible and Groundnut Oil International Prices

Table A1. ADF Unit Root Test, Edible Groundnut Prices, Period 1970-81:

ADF Test Statistic	0.314357	1% Critical Value*	-4.3260
		5% Critical Value	-3.2195
		10% Critical Value	-2.7557

*MacKinnon critical values for rejection of hypothesis of a unit root.

Table A2. ADF Unit Root Test, Groundnut oil Prices, 1970-81:

ADF Test Statistic	-2.588595	1% Critical Value*	-4.3260
		5% Critical Value	-3.2195
		10% Critical Value	-2.7557

*MacKinnon critical values for rejection of hypothesis of a unit root.

Table A3. Johansen Co-integration Tests, Edible Groundnut and Groundnut Oil World Prices, 1970-81

Date: 12/01/02 Time: 12:33
Sample(adjusted): 1970 1981
Included observations: 12 after adjusting endpoints
Trend assumption: Linear deterministic trend (restricted)
Series: EDIBLEGR GROIL
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test

Hypothesized		Trace	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.673526	16.94914	25.32	30.45
At most 1	0.437582	5.755101	12.25	16.26

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Trace test indicates no cointegration at both 5% and 1% levels

Hypothesized		Max-Eigen	5 Percent	1 Percent
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Critical Value
None	0.673526	11.19404	18.96	23.65
At most 1	0.437582	5.755101	12.25	16.26

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Max-eigenvalue test indicates no cointegration at both 5% and 1% levels

Table A4. Unit Root Test, Edible Groundnut Prices, Period 1981-2000

ADF Test Statistic	-3.220154	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

Table A5. Unit Root Test, Groundnut Oil Prices, Period 1981-2000

ADF Test Statistic	-4.142213	1% Critical Value*	-3.8067
		5% Critical Value	-3.0199
		10% Critical Value	-2.6502

*MacKinnon critical values for rejection of hypothesis of a unit root.

II- Granger-Causality Test

Do Senegalese Exports Granger-Cause Groundnut World Oil Price?

DLOGEXP = First Difference of the Log of Senegalese Exports

DLOGINTPR = First Difference of the Log of International Groundnut Oil Prices

The test strongly indicates that Senegal's groundnut oil export granger-cause international price while the reverse is not true.

Table A6. Granger-Causality Test Between Senegalese Groundnut Oil Exports and World Prices of Groundnut oil

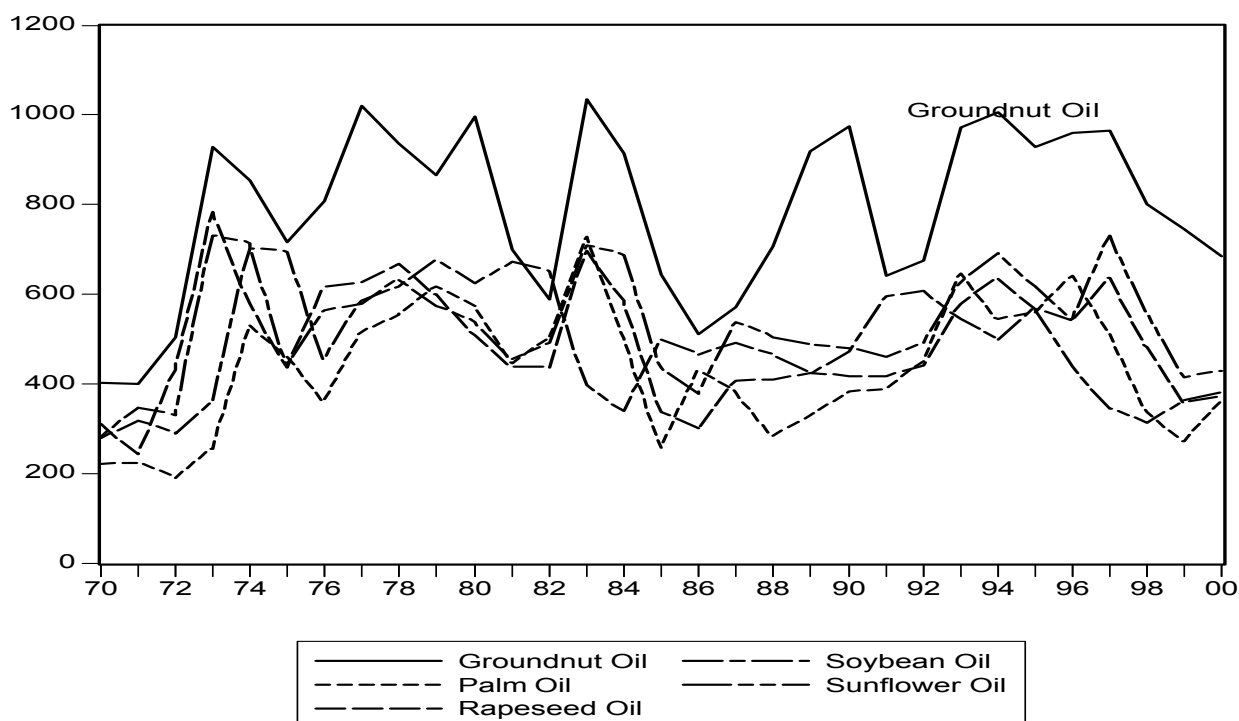
Pairwise Granger Causality Tests

Date: 02/27/03 Time: 17:00

Sample: 1961 2001

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DLOGINTPR does not Granger Cause DLOGEXP	37	0.02753	0.97287
DLOGEXP does not Granger Cause DLOGINTPR		7.43861	0.00222

Figure A1. World Groundnut Oil Prices versus other Vegetable oils

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